

Appl. No. 10/708,943
Amdt. dated February 14, 2007
Reply to Office action of November 15, 2006

REMARKS/ARGUMENTS

Rejection of Claims 1-9 under 35 U.S.C 101 as the claimed invention is directed to non-statutory subject matter.

5 Claim 1 is amended to overcome this rejection. The amended claim 1 recites a method of defect cause analysis involving the steps of providing a single die having a plurality of defects, performing a defect inspection to determine the size and location of the defects, performing a chemical state analysis and a mapping analysis on the single die, and determining the root cause of the defects according to the result of the
10 chemical state analysis and the mapping analysis.

 Claim 7 is also amended to overcome this rejection. The amended claim 7 recites a method of defect cause analysis involving the steps of providing a single die having a plurality of defects, performing a voltage contrast to identify the location of
15 the defects, cutting the single die with a focused ion beam to expose a cross-section of the single die, performing a chemical state analysis and a mapping analysis on the single die, and determining the root cause of the defects according to the result of the chemical state analysis and the mapping analysis.

20 Specifically, the defect root cause analysis disclosed in both amended claims 1 and 7 are performed with respect to a single die, and after the root cause of the defects is determined, the semiconductor process causing the defects can be modified to reduce the number of defects in the single die.

25 The above amendments are fully supported in the original disclosure. For example, paragraph [0024] of the specification states that after the root cause of the defects is analyzed, some corresponding actions, such as correcting the fabricating process can be taken accordingly to reduce the defect generation and solve the problem of the excursions cases, thus improving the reliability of the products.

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By specifying that the semiconductor processes can be modified according to the result obtained from the defect root cause analysis and the root cause analysis is specifically performed with respect to a single die, applicant asserts that the amended claim 1 now addresses a method that produces a concrete, tangible and useful result. Reconsideration of the claims 1-9 is therefore politely requested.

Rejection of Claims 1, 2, and 6-9 under 35 U.S.C 102(e) as being anticipated by Nozoe et al. (US 677677B2).

Claim 1 is amended to overcome this rejection. According to the amended claim 1 of the present invention, after obtaining a single die having a plurality of defects thereon, a defect inspection is performed to measure and determine the size and location of the defects. Thereafter, a chemical state analysis is performed to analyze different types of defects within the single die, in which the analysis involves an inspection for defects having different forms of short circuits, broken circuits or peeling. Subsequently, a mapping analysis is performed to obtain a defect pattern from the single die and compare the defect pattern with a predetermined pattern obtained from a previous semiconductor process. By comparing the two patterns, the claimed invention is able to determine which particular semiconductor process causes the defect. After the cause of the defect is determined, the semiconductor process causing the defects can be modified to reduce the number of defects in the single die.

In contrast to the claimed invention, the step of forming the defects into a defect pattern disclosed by Nozoe et al in column 18 lines 40 to 51 principally involves reviewing a plurality of defects in a particular sequence, in which the reviewing step is performed across a plurality of dies. In other words, applicant asserts that Nozoe et al only teach a means of reviewing individual defects according to a particular sequence, but fail to teach forming the defects into a defect pattern, as disclosed in the

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claimed invention. Inspection of Fig. 7A and Fig. 7B of Nozoe et al will reveal that the review process is performed to scan the defects across a plurality of dies. The defects analyzed by the claimed invention however, are located in a single die.

5 Since the feature of forming the defects of the single die into a defect pattern is absent in the cited reference, applicant asserts that Nozoe et al do not teach the method of defect root cause analysis as per the limitation disclosed in amended claim 1 of the present invention. Reconsideration of the amended claim 1 is therefore politely requested. As claims 2 and 6 are dependent upon claim 1, applicant asserts that if
10 claim 1 is found allowable, claims 2 and 6 should additionally be found allowable. Reconsideration of the claims 2 and 6 is politely requested.

The amended claim 7 recites another method of defect cause analysis involving the steps of providing a single die having a plurality of defects, performing a voltage
15 contrast to identify the location of the defects, cutting the single die with a focused ion beam to expose a cross-section of the single die, performing a chemical state analysis and a mapping analysis on the single die, and determining the root cause of the defects according to the result of the chemical state analysis and the mapping analysis. Specifically, the mapping process includes obtaining a defect pattern from the single
20 die and comparing the defect pattern with a predetermined pattern obtained from a previous semiconductor process.

Similar to the arguments made for claim 1, the step of forming the defects into a defect pattern disclosed by Nozoe et al in column 18 lines 40 to 51 principally
25 involves reviewing a plurality of defects in a particular sequence, in which the reviewing step is performed across a plurality of dies. In other words, applicant asserts that Nozoe et al only teach a means of reviewing individual defects according to a particular sequence, but fail to teach forming the defects into a defect pattern, as disclosed in the claimed invention. Inspection of Fig. 7A and Fig. 7B of Nozoe et al
30 further reveals that the review process is performed for scanning the defects across a

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plurality of dies. The defects analyzed by the claimed invention however, are located in a single die.

Since the feature of forming the defects of the single die into a defect pattern is
5 absent in the cited reference, applicant asserts that Nozoe et al do not teach the method
of defect root cause analysis as per the limitation disclosed in amended claim 7 of the
present invention. Reconsideration of the amended claim 7 is respectfully requested.
As claims 8-9 are dependent upon claim 7, applicant asserts that if claim 7 is found
allowable, claims 8-9 should additionally be found allowable. Reconsideration of
10 the claims 8-9 is politely requested.

**Rejection of Claims 3-5 under 35 U.S.C 103(a) as being unpatentable over Nozoe
et al. (US 6777677B2), in view of Moore et al (US 6777674B2).**

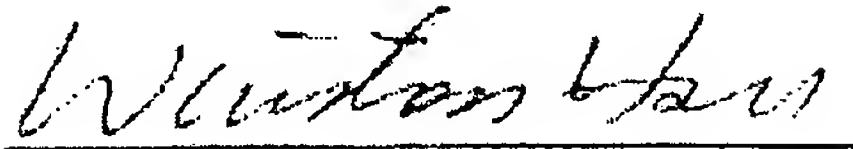
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Claims 3-5 are dependant upon currently amended claim 1. Applicant asserts
that if claim 1 is found allowable, claims 3-5 should additionally be found allowable
as being dependant on claim 1.

20 Applicant respectfully requests that a timely Notice of Allowance be issued in this
case.

Appl. No. 10/708,943
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Sincerely yours,



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- 10 Note: Please leave a message in my voice mail if you need to talk to me. (The time in D.C. is 13 hours behind the Taiwan time, i.e. 9 AM in D.C. = 10 PM in Taiwan.)